

SHORT COMMUNICATION

FIRST CASE OF MATERNAL CARE IN THE FAMILY CRANAIDAE (OPILIONES, LANIATORES)

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ABSTRACT. In this paper, we provide the first observations of maternal care for the harvestman family Cranidae. Adult females of two species, *Santinezia serratobialis* Roewer 1932, which belongs to the group curvipes, and *Santinezia* sp., which is probably a new species of the group gigantea, were found in association with egg clutches. Since the microhabitats used for oviposition by these species are very similar, we believe that maternal care may be a synapomorphic trait of the genus *Santinezia*.

Keywords: Evolution, Gonyleptoidea, *Santinezia*, subsocial behavior

The Cranidae comprises 75 genera and 143 species of large-bodied harvestmen (Kury 2003). The family is distributed in the northern region of South America, along the Andes and Amazon Basin up to Panama and Venezuela (Pinto-da-Rocha & Kury 2003). So far, there is no information on the biology of the cranaids, perhaps because they occur in a biome where few studies on harvestmen have been done (but see Friebe & Adis 1983). In this paper, we provide the first behavioral data for the family, describing maternal care in two species, namely *Santinezia serratobialis* Roewer 1932 and *Santinezia* sp., which probably is a new species.

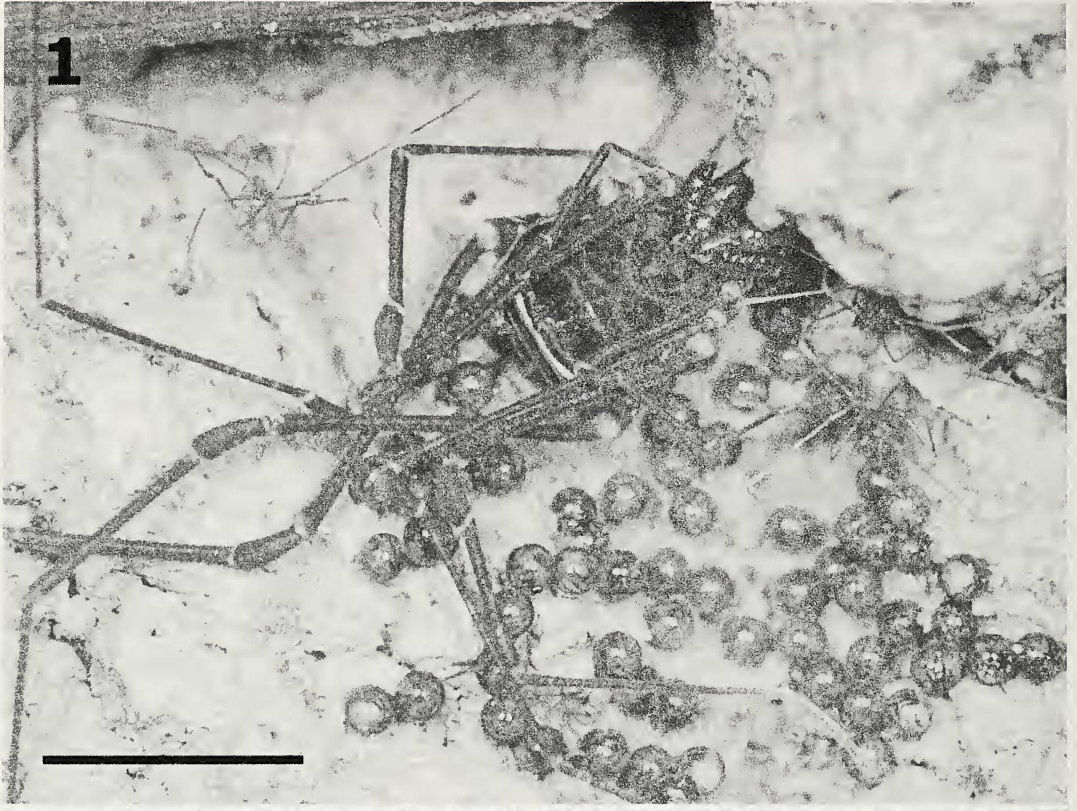
Two females of *S. serratobialis* were found caring for offspring during a field trip to Trinidad, conducted in July 1999 by the second author. Observations were made at two sites, Mount St. Benedict (10°39'N; 61°14'W) and Paria Springs (10°46'N; 61°14'W). The Mount St. Benedict site is located 10 km northeast of the capital Port of Spain, and field observations were done in a small forest fragment. The Paria Springs site is located near the village of Brasso Seco, in the northern coastal mountains of Trinidad, and field observations were made along an isolated road cut. The batches were photographed in the field so that it was possible to count the number of eggs in the laboratory and also to identify the harvestmen.

Only two cranaids are known to occur in Trinidad and Tobago (cf. Kury 2003): *Santinezia serratobialis*, which is one of the most common harvestmen species on the island (R. Pinto-da-Rocha pers. comm.), and *Phareicranaus calcariferus* (Simon 1879), which was described from Colombia but was

also recorded for the Tucker Valley, nearly 15 km south of Port of Spain (Goodnight & Goodnight 1974). Comparisons between our photos and individuals of the former species collected in Trinidad and deposited in the Museu de Zoologia da Universidade de São Paulo, Brazil, allowed us to identify the guarding females as *S. serratobialis*. However, since the individuals were not collected, there are no voucher specimens.

Individuals of *S. serratobialis* at Mount St. Benedict site were found at the bottom of a small ravine, a short distance off a trail inside the forest. One female was observed resting on 38 white, recently laid eggs within a small sheltered damp pocket, high up on a steep overhanging embankment. These eggs were very large compared to the guarding female, with diameters ranging from 23–26% of the dorsal scutum length of the female. At Paria Springs, another guarding female was found near the bottom of a small creek bed within a small damp pocket among tree roots exposed on the steep slope (Fig. 1). There were 70 dark eggs and three early-hatched nymphs (Fig. 1). Both females were found in a stereotyped position, similar to that described for guarding females in other harvestman species (e.g., Gnaspini 1995; Machado & Oliveira 1998, 2003). Although they were not seen grooming or protecting the offspring against predators, we assume that the behavior described here corresponds to a case of maternal care.

An analysis of the harvestmen collection of the Museum of Comparative Zoology (MCZ), Harvard, USA, revealed another case of maternal care in a cranaid species. One female of *Santinezia* sp. was



collected in Valle del Cava (ca. 1800 m), above Felidia, western Cali, Colombia. The individual was collected in January 1977, and the collecting label stated that the female was "guarding the eggs". The female was found on the eggs in a typical resting position and the eggs were attached to the roof of a small natural cavity in a ravine along a road cut bordering the forest (W.G. Eberhard pers. comm.). According to the collecting label, the eggs numbered 103 and there was a sample of 21 large eggs in the vial containing the female. Unfortunately, the eggs were not well preserved, thus it was not possible to measure their diameter accurately.

Recently, Pinto-da-Rocha & Kury (2003) published a phylogenetic hypothesis for the genus *Santinezia*, dividing it into three monophyletic groups: group *curvipes* (11 spp.), group *festae* (2 spp.), and group *gigantea* (8 spp.). The species studied here are representatives of two of these groups: *S. serratotibialis* belongs to the group *curvipes* and *Santinezia* sp. belongs to the group *gigantea* (Pinto-da-Rocha & Kury 2003; A.B. Kury pers. comm.). Until more information on the other species of the genus become available it is not possible to know if the maternal behavior in these two species is homologous. Since the microhabitats used for oviposition by these species are very similar, we hypothesize that subsocial behavior is a synapomorphic trait of the genus *Santinezia* and predict that study of congeneric species will reveal further cases of maternal care.

The genus *Santinezia* shows several morphological convergences with the genus *Goniosoma* (Gonyleptidae), which is endemic of the Atlantic Forest (Kury 2003). According to Pinto-da-Rocha & Kury (2004), only details of leg armature and the male genitalia betray their far remote common ancestry. Species of both genera are large-bodied harvestmen, with glossy teguments, stout and long legs bearing few spines, robust and heavily armed pedipalps, and area II projecting into I until it touches the scutal groove (Fig. 2). In this study we add other convergent traits relating to behavior: females in the two genera lay large eggs and care for the offspring until the nymphs hatch (Figs. 1–2). Moreover, some species of *Goniosoma* may also lay eggs on damp pockets in ravines and on rocks along river banks (Machado 2002; Fig. 2).

As studies on harvestmen behavior have advanced, several cases of parental care have been

described (review in Machado & Raimundo 2001). Maternal care is present in at least five families of the suborder Laniatores, including representatives of the infra-orders Grassatores (Cosmetidae, Cranidae, Gonyleptidae and Stygnopsidae) and Insidiatores (Triaenonychidae). The cranoids belong to the superfamily Gonyleptoidea, which embraces the great majority of cases of maternal care in the order (nearly 80% of the total). All families comprising the Gonyleptoidea have an almost exclusively pan-tropical distribution, being most common in wet, warm environments, such as forests and caves (Shear 1982). Therefore it is possible that maternal care in harvestmen is a convergent behavioral trait adopted by some lineages in response to similar ecological pressures (Machado & Raimundo 2001).

One important question to be investigated in the future is why this behavior has evolved in some species, and not in others. The hypothesis first put forth by Wilson (1971) postulates that intense predation on eggs by conspecifics and ants, as well as the high risk of fungal attack in tropical rain forests may have been the major forces favoring the evolution of parental care in arthropods. Although this hypothesis may explain why maternal care is so frequent among the tropical Gonyleptoidea, it does not provide an answer to question raised above. More recently, Tallamy & Wood (1986) proposed that the answer to this question involves many interacting factors, such as morphological and physiological characteristics of the species, the presence of some behavioral pre-adaptations and phylogenetic constraints. Accordingly, maternal care in arthropods is expected to evolve when females (1) live long enough to benefit the offspring after oviposition, (2) are able to defend the offspring against predators, and (3) are constrained to semelparity (sensu Tallamy & Brown 1999). The morphological and behavioral convergence between goniosomatines and cranoids may provide phylogenetically independent data to test these predictions and thus may constitute appropriate starting point for studies on the evolution of maternal care in harvestmen.

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Figures 1–2.—1. Female of the cranaid harvestman *Santinezia serratotibialis* caring for prior hatching eggs and some early hatched nymphs on a small damp pocket among tree roots in Trinidad (photo by J. Warfel); 2. Female of the gonyleptid harvestman *Goniosoma* sp. caring for recently laid eggs on a quite similar microhabitat in Parque Estadual Intervales, São Paulo state, southeastern Brazil (photo by B.A. Buzatto). Note that, despite phylogenetic distance, these species are morphologically very similar. Scale bars = 1 cm.

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